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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/846,310	05/01/2001	Shizuo Ogura	1998/F 130 (8577*24)	5217

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EXAMINER

MARTIN, ANGELA J

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 06/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/846,310

Applicant(s)

OGURA ET AL.

Examiner

Angela J. Martin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 12-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 17-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 5/1/01.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 12-16 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected method, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 5/5/04.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-11 and 17-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oyama et al., U.S. Pat. No. 5,324,599, in view of Ikeda et al., WO 95/07551, in further view of Friend et al., WO 91/05089, and still in further view of Naoi et al., U.S. Pat. No. 5,723,230.

Rejection of claims 1-11 drawn to an electrode; claims 17-30 drawn to a lithium battery comprising the electrode of claim 1.

Oyama et al., teach an electrode comprising an electrically conductive matrix containing a disulfide group, wherein an S-S bond of the disulfide group is cleaved by electrochemical reduction and reformed by electrochemical oxidation (col. 2, lines 5-15). It also teaches the electrode wherein the matrix contains an electrically conductive polymer and an organic compound having the disulfide group (col. 3, line 3 and lines

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48-62), wherein the polymer is represented by a formula – (Aryl-NH) n - , where n is an integer and the organic compound contains a 5 to 7 membered, heterocyclic ring containing 1 to 3 heteroatoms consisting of a nitrogen atom and a sulfur atom (col. 3, lines 52-62). Additionally, it teaches the polymer having a mercapto group which is capable of forming a disulfide group (col. 4, lines 1-4). It also teaches a lithium battery comprising the electrode as claimed in claim 1; an anode; and a solid electrolyte (abstract). It also teaches a cathode current collector and anode current collector and the components have a layered structure (col. 8, lines 30-41); wherein the collector is a metallic foil (col. 8, lines 36-39).

Oyama et al., do not teach an electrode with a plurality of carbon nanotubes being substantially disentangled and dispersed in the matrix; the electrode substantially free of an aggregate of the nanotubes; the diameter, length, percent by weight of the nanotubes.

Ikeda et al., teach an electrode with a plurality of carbon nanotubes, which are substantially free of an aggregate of the nanotubes (p. 6, lines 26-36). Additionally, it teaches the nanotubes have an average diameter of 3.5 to 75 nanometers (p. 6, lines 27-31) and an average length of at least 5 times the diameter, and preferably 100-1000 times the diameter (p. 9, lines 20-24). It also teaches the electrode contains less than 5% by weight of the carbon nanotubes (p. 11, lines 1-5), and the electrode has a sheet configuration (p. 7, line 11).

Friend et al., teach an electrode that includes carbon nanofibers (p. 2, lines 4-15) with have an average diameter of 3.5 to 75 nanometers and a length to diameter ratio of

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at least 5 (p. 5, lines 25-29); the nanofibers are substantially disentangled (p. 11, lines 1-3) and substantially free of an aggregate of the nanotubes (p. 11, lines 17-26).

Naoi et al., teach an electrode comprising an electrically conductive matrix containing an organic compound (col. 1, lines 64-67) with a disulfide group (col. 6, lines 5-7 and col. 8, lines 21-26) and a plurality of carbon nanotubes (KETJEN-BLACK), wherein the electrode has a sheet configuration (col. 7, lines 31-39). In addition, the polymer contains an aryl group and the organic compound contains a 5 to 7 membered heterocyclic ring containing 1 to 3 heteroatoms consisting of nitrogen and sulfur (col. 2, lines 32-65; col. 3, lines 1-67; col. 4, lines 1-6); the polymer having a mercapto group (col. 2, lines 32-42).


Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to insert the teachings of Ikeda et al., Friend et al., and Naoi et al., into the teachings of Oyama et al., because the carbon nanotubes increase the electrical conductivity of the cathode by forming an effective electrically conductive network throughout the material. Additionally, carbon nanotubes exhibit high electronic conductivity, high surface area, and good corrosion resistance in alkaline and acidic environments (Friend et al.). One of ordinary skill in the art would employ an electrode comprising a matrix containing a disulfide group and carbon nanotubes in order to further improve the electrical conductivity, electrochemical recyclability and capacity of the electrode active material.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela J. Martin whose telephone number is 571-272-1288. The examiner can normally be reached on Monday-Friday from 9:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AJM

A handwritten signature in black ink, appearing to read "Angela J. Martin", with a stylized flourish at the end.